CLAIMS

What is claimed is:

1. A functional polymer that is defined by the formula

$$\pi\text{-}R^1\text{-}\alpha$$

where π is a polymer chain, R^1 is a bond or a divalent organic group, and α is a sulfur-containing heterocycle.

2. A method for preparing a functional polymer, the method comprising:

terminating a living polymer chain with a functionalizing agent where the functionalizing agent is defined by the formula

$$Z\text{-}R^4\text{-}\alpha$$

where Z is a leaving group or an addition group, R^4 is a bond or a divalent organic group, and α is a sulfur-containing heterocycle.

3. A vulcanizate prepared by:

vulcanizing a rubber formulation comprising at least one vulcanizable rubber and a filler, where the at least one vulcanizable rubber is a functional polymer that is defined by the formula

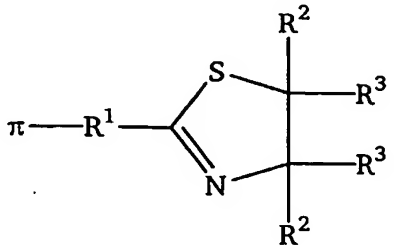
$$\pi\text{-}R^1\text{-}\alpha$$

where π is a polymer chain, R^1 is a bond or a divalent organic group, and α is a sulfur-containing heterocycle.

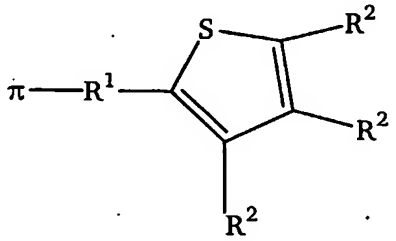
4. The polymer of claim 1, or the method of claim 2, or the vulcanizate of claim 3, where the sulfur-containing heterocycle comprises a thiirane, thietane, thiolane, thiazole, thiazoline, thiazolidine, thiadiazole, thiophene, dihydrothiophene, benzothiophene, naphthothiophene, thienothiophene, thiadiazine, dithiazine, thioxanthene, thianthrene, phenoxathiin, benzothiazole, isothiazole,

dihydroisothiazole, thienofuran, thiomorpholine, or thialdene group or a substituted form thereof.

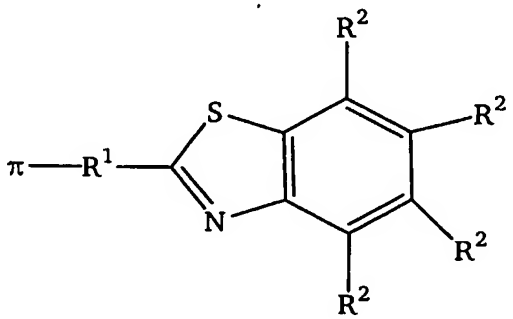
5. The polymer of claim 1, or the vulcanizate of claim 3, where the functional polymer can be defined by the formula



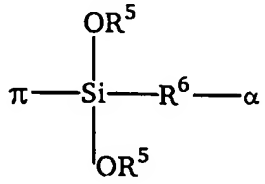
where π is a polymer chain, R^1 is a bond or a divalent organic group, each R^2 is independently hydrogen or a monovalent organic group, each R^3 is independently hydrogen or a monovalent organic group, or where each R^3 combine with each other to form a divalent organic group; or



where π is a polymer chain, R^1 is a bond or a divalent organic group, each R^2 is independently hydrogen or a monovalent organic group, or where two or three R^2 groups combine to form a multivalent organic group; or



where π is a polymer chain, R^1 is a bond or a divalent organic group, and each R^2 is independently hydrogen or a monovalent organic group, or where two or three R^2 groups combine to form a multivalent organic group; or



where π is a polymer chain, each R^5 is independently a monovalent organic group, R^6 is a bond or a divalent organic group, and α is a sulfur-containing heterocycle.

6. The polymer of claim 1, or the method of claim 2, or the vulcanizate of claim 3, where R^1 includes the residue of an addition reaction between an addition group and a living polymer, and wherein the addition group comprises a nitrile group, a Schiff base, a ketone group, an aldehyde group, or an ester group.

7. The polymer of claim 1, or the method of claim 2, or the vulcanizate of claim 3, where the polymer chain is a rubbery polymer having a Tg that is less than 0°C.

8. The polymer of claim 1, or the method of claim 2, or the vulcanizate of claim 3, where the polymer chain is polybutadiene, polyisoprene, poly(styrene-*co*-butadiene), poly(styrene-*co*-butadiene-*co*-isoprene), poly(isoprene-*co*-styrene), or poly(butadiene-*co*-isoprene).

9. The method of claim 2, where Z comprises a halide, a thio alkoxide group, an alkoxide group, a dialkyl amine group, a nitrile group, a Schiff base, a ketone group, an aldehyde group, or an ester group.

10. The vulcanizate of claim 3, where the filler is carbon black, silica or both.